DOCUMENT RESUME

ED 235 656 EC 160 814

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TITLE The Profoundly Handicapped Child: Assessing Sensorimotor and Communication Abilities. Working Papers in Developmental Disabilities.
INSTITUTION Nebraska Univ. Medical Center, Omaha. Meyer Children's Rehabilitation Inst.
PUB DATE Apr 78
NOTE 35p.; Paper presented at the Nebraska Conference for Teachers of Severely/Profoundly Handicapped and Deaf/Blind Children (Cozad, NB, April 12-14, 1978).
PUB TYPE Speeches/Conference Papers (150) -- Guides - Non-Classroom Use (055)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Development; *Communication Skills; Curriculum Development; *Multiple Disabilities; Sensory Experience; *Severe Disabilities; Student Evaluation

ABSTRACT

The paper addresses the assessment of sensorimotor and communication skills in profoundly/multiply handicapped children. The problems inherent in assessing this population are described, including lack of validity of developmental norms established on children with intact sensory systems. Factors affecting sensory organization are reviewed, including attention, arousal and state, self-stimulation, complex visual system problems, and functional hearing. Typical problems involved in assessing the cognitive development of profoundly handicapped children are cited in a review of the Sensorimotor Cognitive Assessment "means-ends" subscale. Effects of sensory, motor, and cognitive factors on the child's grasping, approach or reach, and ability to make things happen are considered. Assessment of communication with this population begins with evaluation of signal levels. Modes of communication (visual, auditory, tactile components) and the effects on meaning are discussed. The relationship between communication and interpersonal attachment is commented upon in a final section. (CL)

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ED235656

Working Papers in Developmental Disabilities

Meyer Children's Rehabilitation Institute/University of Nebraska Medical Center

THE PROFOUNDLY HANDICAPPED CHILD: ASSESSING SENSORIMOTOR AND COMMUNICATION ABILITIES

Nancy Fieber, M.A.

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THE PROFOUNDLY HANDICAPPED CHILD:

ASSESSING SENSORIMOTOR AND COMMUNICATION ABILITIES

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Nebraska Conference for Teachers
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Cozad, Nebraska
April 12-14, 1978

Submitted for Publication
at Conference Proceedings,
Nebraska Department of Education

NOTE: This paper represents the opinions of the author and not necessarily that of Meyer Children's Rehabilitation Institute or the University of Nebraska Medical Center.

THE PROFOUNDLY HANDICAPPED CHILD

ASSESSING SENSORIMOTOR AND COMMUNICATION ABILITIES

Nancy Fieber, M.A.

This presentation is addressed to those teachers and therapists who work with profoundly handicapped children. This group includes those children who can only perform at the level of a few months on a standardized psychological assessment, who often have severe seizure disorders and may be severely motor handicapped as well. These children have been unable to interpret their environment and have had little control over their environment.

Less obvious than motor impairments, but probably even more significant educationally, are a high incidence of sensory and multisensory impairments in vision and hearing. These have often been inadequately diagnosed, inadequately treated, and not appreciated in approaching these children as learners and communicators. Such sensory input from environment that has gotten through may have no meaning because of lack of correlating information. This is a very diverse group of multihandicapped children with complex interactions between sensory deficits and motor deficits, and it is no wonder that teachers complain that materials don't really fit them.

Most of the assessment models available to educators for developing curriculum, measuring progress and gathering program data do not adequately meet the needs of the profoundly handicapped. There are too few items appropriate at the lower levels. The developmentally based skill sequences are derived from the behaviors of sensorily intact children and often are not valid. At this point we do not always have adequate sequences to substitute. The work of Selma Fraiberg is beginning to help us understand

the early development of visually impaired children, but there are still many gaps (1966, 1968, 1975). At this time it is hoped that a flexible approach to assessment and curriculum can be allowed, so that a teacher can supplement according to a child's individual needs.

Because motor impairments are so visible, it is not unusual in programs for profoundly handicapped children to see emphasis on motor management and feeding. These are essential and will require adequate physical and occupational therapy support by therapists trained in cerebral palsy and other pediatric conditions. Often no cognitive goals are even listed as the child has not been considered ready for cognitive goals, largely due to the inadequacies of assessments used. Even with the Piagetian Sensorimotor Cognitive Assessment we use in our Infant Program (see chapter by Robinson and DuBose) there are many children who fall below this assessment, or for whom the described curriculum doesn't seem to be working.

Problems with cognitive and communication curriculum often occur because of poorly understood sensory functioning and implications for adaptations, goals, sequences and strategies. For example, visual tracking is considered to be a precursor to the visual search problems of the object permanence development sequences. If the child is visually impaired, with only light and shadow perception, this activity may hopefully prepare for some use of residual vision in localizing things, but the child in early development will not associate this perceptual event with an object on which he has acted. Nor will a "Look at me," program go anyplace for this child. When a child has severe motor impairment of oral functions and a hearing loss, a "Reciprocal vocal initation" goal is probably going nowhere and other communication goals and strategies may be more productive.

Somehow we must find not only the "cognitive match" stressed by Hunt (1960) as being critical for cognitive learning and intrinsic motivation, but a "perceptual match" and a "communication match. " A diagnostic teaching approach is critical both in assessment and teaching, and analysis of tasks must involve processes and prerequisities. Today we will discuss some assessment areas and curriculum implications which will help us make the right match for a child. Areas emphasized will be particularly concerned with interpretation and control of environment.

Factors Affecting Sensory Organization

We attempt to find out a child's sensory abilities through medical and audiological reports and through functional vision and hearing asessment. Assessment may involve some specific tasks or probes, however, it must be tied into assessment of other areas of behavior and observation of the child's spontaneous behaviors. There are also several factors related to sensory organization which need exploring and which may lead to specific strategies.

Attention. Bruner (1969) has described developmental changes in attention which may be pertinent to this population. The newborn, or child at a very primitive level, shows very diffuse or distractable attention. Although fixation reflex is present at birth, a newborn fixates only briefly, then attention is lost. In the first few months the infant is able to focus attention longer, in fact seems to lock on a stimulus--a stage of stuckness. We often see such stimulus controlled behaviors in our profoundly handicapped children, especially those with hyperopia (farsightedness) and poor accommodative ability who cannot shift focus appropriately. Such children seem "caught" by stimuli; they do not shift gaze readily between visual stimuli and only attend to one thing; looking seems to interfere with listening. Finally attention becomes more self-regulated.

The child shifts attention voluntarily and may decide not to look or listen to a familiar stimulus which has become boring.

It is not unusual to hear from a teacher who has been working with fixation or tracking with a child, that the child all of a sudden won't look. The teacher's data has shown longer durations and arcs and now these have decreased. The child may even close his eyes and appear to avoid the stimuli. This may be because the child now processes stimuli faster, or he may be able to recognize the familiar and is more interested in novelty. He may be able to control his own attention and not look. The child has really progressed but the avoidance can cause some real setbacks.

Attention should also be observed in terms of mode. A child may show better attention in one modality than another, even in an impaired channel. This may not always be in accord with opthalmological and audiological information. It is not unusual to read in a report that a child has no useful vision and that his hearing loss is not significant, yet the child has developed and relies on his residual vision and doesn't use his hearing at all.

Positioning can facilitate or interfere with attention. We show a little boy in the videotape who is learning to associate location of tracked visual stimulus with localized sound stimulus and the ability to roll from back to that side. His attention is caught by ceiling lights until a pillow is placed to flex his head more. He is shown in supported sitting working on head righting. Due to his oculomotor instability his visual contact with environment or presented stimulus is rare. When his head is steadied by the therapist's hand he looks and follows and has much better visual attention. Motor instability will not be conducive to attention. The teacher and therapist will have to clarify just when the activity's purpose is motor challenge and when it is cognitive challenge,

and provide thoughtfully for both, but not at the same moment.

Arousal and state. Responses to sensory input may also be affected by the disorders of state and arousal which may occur as a consequence of central nervous system problems. There are children who are irritable and difficult to sooth, children who overload to environmental stimuli, and children with severe seizure and medication problems who are lethargic, hardly reacting at all. State may affect responses to stimuli and activities in turn may affect state.

The classification of states in the neonatal infant has been useful with very low functioning children as well as infants with state disorders. The most typical classification includes deep sleep, light sleep, drowsiness, crying, alert and active, and alert and inactive (See Lewis, 1972; Moss and Robson, 1970; and Wolff, 1966). The alert and inactive state is the most conducive to visual and auditory attention. At the same time looking behaviors may quiet the child, even impacting on movement and tone.

The child shown in the videotape is very caught by the brightly painted wall patterns and ceiling lights of a new room and becomes a quiet looker. If we screen off distractions we obtain attention for looking activities, but he does not then show much motor activity when offered a "swatter" he usually enjoys. Later we see him in an alert and active state following some handling and bouncing game on a big ball. He now uses limb movements as "procedures" to elicit more of the game, and when placed in supine again he actively repeats movements producing an auditory/visual spectacle. We need to sequence events thoughtfully for him--planning activities according to state as well as manipulating his state through activities.

We have a great deal to learn about the effects of varying stimuli on state with our handicapped population. We do have some information from the literature on interventions affecting state and soothing in neonates

(Brackbill, 1973; Korner and Grobstein, 1966).

A particular form of sensory input, for example vestibular stimulation, can have varying effects. Bringing a child abruptly from supine to upright, or bouncing a little, has elicited eye opening and alerting with several very lethargic children, similar to findings of Korner's research with neonates. Slow rhythmic rocking, especially accompanied by rhythmic sound, has enabled some very irritable and unsoothable infants to quiet and begin attending to outside stimuli. The visual organization of children with complex central oculomotor system problems, deviations of gaze and poor fixation reflexes, is adversely affected by vestibular stimulation such as rocking, turning, or bouncing, as they already tend to have uninhibited vestibular-ocular reflexes interfering with fixation (Fieber, 1974). Sensory stimuli should not be treated as recipes--effects should be measuable in terms of definable state changes or specific functional abilities such as fixation.

Self-stimulation. The child's habitual self-stimulatory behaviors can provide much useful information about sensory status and what is reinforcing to a child. Before jumping into a behavioral program to eliminate any such behaviors, further analysis is needed to see what they tell you and how the child may be using them.

First observe the modes in which self-stimulation occurs. Some self-stimulatory behaviors occur particularly with significant visual system impairments. Eye-poking or "sparking" is an example--pressure on eye and nerve elicits light and pattern phenomena. In my opinion light gazing and flicking an object or fingers close to eyes also imply a visual system problem. When the impairment is known, self-stimulation can give clues about residuals. The light gazer obviously has light perception; the child

moving fingers or shiny object close to eyes must have some perception of light, shadow or movement, and we know what is reinforcing to him. If we observe how close he holds it or in what field he holds it, or the position in which he holds his head, we have functional vision information which may help us in teaching strategies as well as assist the opthalmologist.

Some children will self-stimulate with motor activity in spite of severe motor impairments--constant limb movements, rolling head or changing position. Some will self-stimulate in what appears to be an abnormal tonic reflex posture, such as the child who throws himself back in extension, smiling spacily, and rolling up his eyes. This is not always involuntary--one needs to determine what is uncontrollable and what is deliberate. This is not unusual with sensory impaired multihandicapped children, especially in an institutional setting.

The effect of positioning on self-stimulation should be explored. In the case of the child who self-stimulates in the extensor pattern, a partially tipped up flexed posture may enable the child to bring down eyes and attend outward. Some children's self-stimulation is very tied to a habitual posture, and one may get attention outward directed more easily in another posture. The child may also vary type of self-stimulation in different postures, for example, light gaze and kick or hit chair in wheel chair.

Mouthing is one of the behaviors which most often concerns teachers. This can vary qualitatively--it may be a perseverative assimilatory biting or sucking scheme, or outward directed in scanning or identifying. This is a logical and necessary form of examination for a visually impaired child. Actually, I am glad to see mouthing in a profoundly handicapped child--it is often not possible motorically.

The child may mouth only certain objects for which there are no meaning,

exploiting others with a variety of object schemes. Here one must look closely at object attributes and the issue of perceptual and cognitive match. One little boy mouths all small objects--if they are bigger and have a visually interesting movement attribute, he tries out a number of visual and sound-producing schemes.

We also want to know what happens if we interrupt a self-stimulatory behavior. Can the child stop the behavior when presented an interesting alternative? Can the teacher gently restrain the behavior--does the child shift attention to the activity or is he so stressed that there is no attention? Does the child attend while doing the behavior?

Experienced educators of visually impaired children have long suspected that self-stimulation was related to sensory deprivation, boredom, stress and frustration (Knight, 1972; Tait, 1972). Now there is research suggesting that self-stimulation may be used by the child both to increase and decrease arousal level or to shift between states. Changes in heart rate, respiration and EEG have been demonstrated (Sroufe and Waters, 1977).

At this time we need to be aware that some self-stimulation at least, may have served or be serving some adaptive function for the child. Perhaps we can someday distinguish between self-stimulation which serves a function and that which has merely become an empty stereotypic activity. We always need to be sure our tasks and activities really are appropriate and be thoughtful in considering how to decelerate such behaviors if we really need to at all.

Complex Visual System Problems

The visual problems found in the profoundly handicapped group include complex central visual and oculomotor system problems as well as defects of eye or optic nerve. The eye is only the peripheral receptor for the visual system, which also includes the specific pathways and centers of the brain

involved in visual functions. The oculomotor system is included in the visual system and involves control of the external and internal eye muscles necessary for looking behaviors.

Often incorrect assumptions are made from evaluations. When a child has a central visual system problem such as inability to fixate we should not brush this off as due to mental retardation or cerebral palsy--ever a premature infant can fixate. When the ophtalmologist reports a normal peripheral eye structure this does not mean vision is intact--the child may have no vision. When a refractive error is insignificant, normal acuity can not be implied. Misinterpreting eye reports can lead to inappropriate educational goals and strategies. A functional vision assessment is a necessary part of educational evaluation for deaf-blind and multihandicapped children and is described in another paper (Fiociello). The profoundly handicapped child's visual system problems require some special considerations of very early levels of functioning and abnormalities common to this group.

We are beginning to appreciate that visual functions are hierarchical and that we must divide these into localization or spatial vision and discrimination vision. Localization vision includes a variety of looking actions which may be differentially affected. Discrimination functions are theoretically higher and will be affected by the intactness of localization functions. A localization behavior does imply that the child discriminates something, but the commonest error we make is assuming that because he looks at something or picks it up, he sees it the same way we do.

Included in localization functions are, first of all, the fixation and following reflexes present at birth which, with development, come under some voluntary control. The fixation reflex orients the eye so that an image reaches the fovea, or area for clearest vision on the retina. Mechanisms de-

velop to keep eyes and head centered with each other to facilitate a clear image. A good way to appreciate this is to look straight ahead and move some written material just barely into your peripheral visual field. You are aware of something, but form and pattern are blurred. If you turn your eyes as far as you can without head movement, the gross form of the paper begins to take shape but the pattern is still blurry. If you then turn your head to center with your eyes the pattern is now clear because the image is now on the fovea. Now hold the paper in front where you see clearly and without moving your eyes move the paper laterally. It becomes blurry, but if you could track it outward you could maintain a clear view. It becomes apparent that looking or localization can affect discrimination.

With development the child fixates and follows longer, and in various directions, acquires ability to turn eyes to peripheral stimuli, holds a fixation at periphery of gaze, blinks to approaching stimuli, shifts gaze horizontally and vertically, and turns eyes to auditory stimuli out of sight. Following and shift of gaze also develop between near and far, with convergent and divergent movements in coordination with accommodation of the lens of the eye, enabling adjustment of focus for different distances. These enable the child to expand focal distance, the distance at which images are clear, beyond the narrow 7-10 inches of the newborn. When these functions do not develop properly, things may appear like a picture taken with the camera out of focus.

Each of these localizing functions develops at a predictable age and involves maturation and intactness of specific pathways and centers, some of which are known. It is possible to determine that localizing behaviors are developmentally discrepant with selected other behaviors. Many behaviors will be dependent on localizing such as visually guided reach or visual fixation of sound sources leading to auditory associations. Therefore,

one may not be able to use discrepancy with over-all cognitive level as a criterion for saying a visual system problem is significant. This is important when we come to labeling children for educational purposes or certification as deaf-blind.

Specific problems can occur with any of these looking or localization behaviors and each has implications for educational strategies in visual training or compensations. Tracking or smooth pursuit of moving stimuli involves different central pathways than shift of gaze or the saccadic pursuit of visual analysis, and these may be differentially affected. One child has not been able to track moving stimuli but can shift gaze. Although his near and far focusing is also limited he can discriminate things at a certain distance. We have had to adapt visual task presentations as well as provide compensatory experiences for all he misses visually. He can eye-point to wants and named pictures and demonstrates understanding of verbal commands with touch and situational cues.

These are different gaze centers for each direction of gaze and these may be specifically impaired so that a child may be unable to move his eyes in one direction. If this is downward and he cannot compensate with his head, he is going to miss whatever is presented on his tray, or it will be blurred as was the paper in your peripheral gaze. If a child cannot hold a fixation at the extremes of gaze, he will not be able to maintain gaze at point of disappearance of a tracked object. We may need other criterion behaviors and perhaps experiences in another channel in developing object permanence concepts.

A visual assessment, medical or functional, is incomplete unless it considers both near and far vision and relates these to the child's developmental needs. The near vision deficit is especially critical for the far-sighted child shown in the tapes, who has no apparent convergent movements

and appears to lack compensatory accommodation. He has no visual contact with his hands. He fixates at near only to objects which have light, movement or sound with background blotted out. Figure-ground is poor for such children, and only when we eliminate background does he seem to discriminate and recognize specific objects such as his baby food jar several feet away on the mat.

In addition to these lacks in functions there are a number of abnormal oculomotor system problems which occur. One of these is nystagmus, the jerking or roving movements of the eyes. If the child has vision, the movements will blur it. Another problem we see is a strong deviation of eyes in one direction, often associated with inability to free eyes or fixate. This is not simply part of cerebral palsy, but involves damage to eye-head movement centers and often seizure disorder. A child with cerebral palsy, who has strong tonic spasms of the neck, may have eyes pull in direction of head at times, and some limitation of effective range of eye movements. If he has an intact visual system will be able to fixate, follow and discriminate when appropriately positioned. Another central visual or oculomotor system problem which can occur is exaggerated and sustained eye movements opposite direction of head tilt or rotation, which also interfere with fixation. These are an exaggerated version of the Doll's Eyes Movements which occur in normal neonates. These mechanisms may interact in such a way that eyes can free and center in one posture and not in another. Assessment determines optimal positioning for freeing and centering the eyes, the condition necessary if some ability to fixate is to develop. Frequently the optimal position will be supine with head fixed and centered, or possibly lying on the side to which a strong deviation occurs.

Others of this group have abnormalities of vergence consisting of internal strabismus or esotropia (inward rotation of eyes), or external

strabismus or exotropia (outward rotation of eyes). Not only do such children not have binocular fusion of images, they may have double vision or have lost the use of one eye. All the localization deficits and abnormalities described can significantly affect discrimination, especially in a child with poor compensatory abilities.

Discrimination vision involves perception of light, shadow, movement, color, form and pattern. We have no way of being sure exactly what a child sees until he can point to named pictures at 20-24 mos. or can perform matching tasks at an age three level. Therefore, acuity as usually defined in terms of Snellen equivalents, is often not measurable. We have been exploring clinical use of the stimulus preference and habituation methods used by experimental psychologists in studying the very early vision of infants. Some other ways of inferring discrimination are also possible if other cues are carefully ruled out. One is discrimination or differentiation of faces, as demonstrated by preferential responses, recognition, etc.--a behavior possible in 2 mos. old infants. Another is eliciting a smile to a smile, when face alone did not elicit a smile. Some level of pattern or form discrimination must be present. When a child visually recognizes an object, and goes right to a specific scheme without first handling or trying it out, something must be discriminated. One must be careful in deciding what--the child may recognize a color blob or just a shiny glint. If the child selectively chooses preferred objects or toys, one may explore the possible aspects discriminated more carefully. An object of similar size and color may be paired with the preferred toy--if the child still chooses it, one can assume there is some element of form or pattern vision. When we saw the child in the tape recognize a baby food jar and get excited in anticipation of eating, we again can infer some form and pattern vision as there were no other situational cues--he was not usually fed in this setting. Our errors are probably

most typically in overestimation of discrimination—extreme caution is needed.

What do we do with this information? One important purpose of a functional vision assessment is to provide information to the ophthalmologist about how a child uses his vision. This may assist him in evaluation and treatment decisions. Often it is not possible to obtain a good functional appraisal of these children in the medical office.

With every multihandicapped child who has any potential residual vision we should have functional vision training goals. These should be thought of as a separate area of curriculum with long-term goals unknown. I have become very concerned, however, at how some teachers have confined teaching to deficit areas or made progression of cognitive curriculum contingent on improvement of visual behaviors. I believe curriculum strategies should always take advantage of the child's strengths, if necessary teaching to other modalities and substituting other criterion behaviors as necessary. These are discussed in Fieber (1977).

Functional Hearing

A functional hearing assessment is also part of an educational assessment for multihandicapped children. Again the assumptions made may overestimate the child's hearing abilities. Several aspects or levels are assessed: 1) Awareness at a reflexive level; 2) Awareness with attention/alerting; 3) Localization; 4) Discrimination; 5) Recognition; 6) Comprehension. The material discussed is available in detail in a manual for Assessment of Auditory Functioning of Deaf-Blind/Multihandicapped Children by Deborah Kukla and Theresa Thomas (1978).

As in vision, it is important to differentiate between discrimination and localization functions. It is possible to discriminate a sound or word and not be able to localize it. This occurs in the child with hearing in only

one ear or an asymmetric loss. Localization depends on a time difference for sound waves reaching the two ears. Some of the children with severe visual system problems may not be able to turn eyes or head and fixate sound source. When a child cannot turn and visually identify sound source, for whatever reason, it will be difficult to identify and make meaning of sounds.

Our sensorimotor cognitive assessment samples only the first milestone of sound localization--lateral to ear. It is necessary to check the further developmental sequence as follows: lateral to ear at 4-7 mo.; lateral and then downwards at 7-9 mo.; directly to lateral and downward source at 9-13 mo.; lateral and then upwards at 13-16 mo.; directly to lateral and upward source at 16-21 mo.; and to almost any angle at 21-24 mo. (Northern and Downs, 1974). Midline sounds are most difficult to localize and the blind child cannot differentiate between front, above or behind. He learns to reach in front based on past experiences and to finally turn or tilt his head to assist localization. In considering how well the child is correlating visual and auditory information and in exploring a blind child's use of sound in directing reach or locomotion, this sequence must be considered.

We should be cautious about inferring discrimination from localization behaviors, although some awareness of presence of sound is implied. A teacher presenting sounds at 6 inches lateral to a child's ear may obtain a localization reponse and assume hearing is fine. All it means is that the child hears something at six inches. If a noisemaker is used one needs to consider frequencies (high or low pitch grossly), loudness and distance. A useful chart in Kukla and Thomas (1978) describes the loudness range of a number of familiar toys at varying distances. For example, the Creative Playthings wooden clacker has a loudness of 70-80db at a range of 6 in. to 2 ft., and 60-70db at 6 feet. The Fisher Price Music Box Owl

has a loudness of 50-60db at 6 in. to 3 ft., and under 50db at 6 feet. The child may discriminate these and not discriminate speech, and may have as much as a mild to moderate loss.

It is easy to assume a child discriminates and recognizes speech when we give verbal commands. The child may only be discriminating presence of voice and responding to total situational cues. A trained teacher of the deaf-blind, deaf educator or speech pathologist can assist in interpreting reponses appropriately.

In the profoundly handicapped population we see a high incidence of chronic middle ear disease or serious otitis. When this occurs chronically during the first few years of life there may be a significant impact on auditory system development. Audiological evaluations with impedance testing are a necessity for this group. Cortical evoked response audiometry may be necessary to clarify neurological and conductive components. Repeated audiological evaluations are indicated to monitor status of children with the chronic otitis media history, as the condition may reoccur.

Cognitive Assessment and Curriculum

As we attempt to utilize the Sensorimotor Cognitive Assessment there are many problems when the child has visual or hearing deficits, especially when combined with motor deficits. We will need different criterion behaviors and must understand the area being tapped. We can use the original criterion behavior sequences, with modification of motor responses, for the child who is motorically impaired with intact vision and hearing. The assessment is very visually oriented, and when vision is impaired we will need different ways to sample and develop the same ideas. Adaptations for deaf-blind and other multihandicapped children have been described in Fieber (1977) with emphasis on lower levels of curriculum.

In this paper we will give examples of some of the most typical prob-

lems encountered in the Means for Achieving Environmental Events and Causality Subscales where we see the beginnings of the child's ideas of acting on environment, particularly with use of the hand as a tool. This is one of the most frustrating areas when teachers try to implement sensorimotor curriculum.

The first three items of the "Means-ends" subscale are:

1) Hand-watching. Coordination of two schemes, moving arm to visually explore hand. Generally observed in supine in infants.
2) Child repeats an early motor movement (batting, kicking, head motion, etc) which activates a visual or auditory spectacle.
3) Child reaches and grasps toy when both hand and toy are in view--then with just toy in view.

Problems in these areas involve cognitive factors, motor factors, and sensory factors. We will have to factor out mental and motor factors and always keep in mind that if we expect a child to act on environment the event must be perceivable. A perceptual match with vision and hearing is critical.

The beginnings of reach and grasp seem to be separate mental events which are finally coordinated, a kind of sequencing forward or foresightful use of schemes. Experience with assessing and training a number of children who did not use their hands suggests that discrepancies may exist between the two schemes and that it is appropriate to design parallel curriculum suquences which finally merge rather than arbitrarily sequencing reach and grasp events together.

Schemes for grasping. The basic scheme for grasping is included at the beginning of the Object Schemes subscale, but it also relates to the Means-ends subscale and should be developed at the same time as the hand-watching and repetition of movements producing a spectacle. Grasp normally begins with automatic responses to stretch and touch, and during these phases grasped objects are retained only briefly. Voluntary grasp, or

the "grasp scheme," normally appears as the reflex wanes and the child retains grasp longer to maintain an interesting perception. Fisted hands begin to open and an open hand will encounter graspable things--body parts, clothing, crib environment.

Children with tightly fisted hands, abnormal postures and restricted movement may not encounter graspables in this way, and unless someone places things in their hands, may not develop a mental representation of grasp. Many severely athetoid children cannot maintain grasp due to conflicting withdrawal reactions, though they may have the idea and intent. With other children there is no motor excuse--hands are open, motor grasp occurs with grasping of hands or feet, but there is no grasp scheme for objects. One must look at both the motor aspect and the cognitive intent. When it is difficult to tell, because the hand is so tightly fisted, one must look for indications of awareness such as quieting, a tentative movement toward the mouth, visual or head orienting, etc. The next steps will involve effort to coordinate grasp with other schemes such as mouthing, looking, or listening, and if these are present, one can assume some sort of grasp scheme.

The means-ends and causality subscales begin with hand-watching. This is an important precursor of visually directed reach and of looking at hand grasping object. As the child looks at hand grasping, he realizes that the thing seen is graspable. The coordination of grasp with mouthing is an important aspect of early hand use which may often be impaired. It does not seem to be as critical in the development of reach and grasp, however, as is the coordination with looking or listening. One or the other is going to be necessary if the child is ever to direct his reach to an object, then grasp it.

Can the child see his hand? The coordination of visual schemes with hand and grasped object may be very difficult for a motor impaired child.

Due to exaggerated neck extension and abnormal quality of the asymmetric tonic neck reflex the hand may never intersect with gaze, whereas in the normal supine infant this pattern allows or facilitates hand-watching. Even in side-lying positioning, neck extension and upward eye deviation combined with extended arms may prevent hand watching. The motor-impaired child may also have difficulty maintaining grasp while moving arm, interfering with coordination of grasp with other schemes. The child may drop the object but show clear intent. With positioning, "dressing up" the hands to catch the eyes, and assistance, the child may look at his hand.

Children with visual handicaps may demonstrate the hand-watching behavior, but at such a close focal distance that this localization does not progress in the normal sequence to directing reach. The child who cannot focus at near also may deviate from the normal sequence, and the blind child must follow a different route using memory of movement and sound.

The far-sighted little boy in the tapes has never had any visual contact with his hands. He has developed a grasp scheme and it is coordinated with a listening-shaking scheme and efforts to mouth. At this time his grasp schemes, and reach or approach schemes, are still separate events.

The blind child prepares for eventual reach in his coordination of grasp with listening--he learns that objects heard can be grasped. He is very dependent at first on adults making things available and placing them in his hands. Sound will not direct his reach for some time.

Schemes for approach or reach. When the hand-watching child encounters a visual stimulus at the side of his crib he sees his hand by the stimulus. This may lead to repeated approach movements to the visual stimulus without necessarily any intent to grasp or act on the object. At times interest in a visual stimulus at the side seems to draw the hand to it, also preparing for a more foresightful approach.

The discovery that arm movements may cause something to move or sound also prepares for reach as we see the development of a swipe or swat to the side. This swipe evolves from a fisted swipe to open-handed batting, and it is possible for hands that have been flexed in spasm to begin to open though other extensor patterns, such as protective extension, may not yet be present.

A significant step occurs when a child sees an object, approaches or bats it intentionally, and then when contacting, seems to think of grasping, as if an afterthought. With our profoundly handicapped children, this appears to be a major stage occurring before the child reaches with obvious intent to grasp. With these children I usually do not see the slow approach with alternate glancing between hand and object which has been described in normal infants as "Piagetian reach." This requires visual abilities these children may not have. The child in the tape, although without visual contact with grasp, does swat at a seen stimulus to the side--he knows the visual stimulus can be approached. Apparently it is just far away enough so that it is perceivable. The next step we want to see for him is : while swatting he begins to grasp, preparing for a more intentional sequencing.

Blind children prepare for reach by repeating swats in the location where they previously encountered something, and when swatting may also grasp. This prepares, along with development of sound localization, for eventually reaching to a recognizable sounded object. The lateral and downward localization seems to be the stage when we see reach to various locations on table or floor as the child sits, or toward his hands laterally in supine. Lateral placements will assist the early stages of localizing.

Making things happen. In the normal course of events the repetition of movements causing an auditory or sound spectacle includes arm movements, assisting in the reach-grasp developmental sequence. A very important aspect of this behavior is the child's realization that he can make things

happen. If we are not seeing arm movements, however, we look for any possible movement that might be harnessed to help the child become a causer of events. We observe the child's spontaneous movements to determine the most probable movement, and define it in terms of part of body, direction and arc, so that it can be counted. We then record a baseline of number of movements in 3 or 5 minutes. The next step is to explore placement of an easily activated auditory/visual spectacle such as brass or fish-scale wind chimes, probably in contact with the limb so that the slightest movement activates it. We avoid tinkling the chimes, except as a little prompt when the child is not moving, and guarantee a tinkle even for minimal movements. A yarn tie with slight tension may help harness slight movements, and may increase awareness of the limb. Often we need to experiment with placement till we find the optimal arrangement or spectacle. We record the number of movements in 3 or 5 minutes, not just the successful ones in tinkling the chimes, as we want a consistency with our baseline method. In early training it may be helpful to record baselines and contingent movements for each session, as changes are slow for some children, and performance may be variable from day to day due to seizures, arousal problems, etc.

One may need to experiment with different positioning arrangements. Experiences have suggested that children often move limbs more successfully in supine posture, arms in usual postures to start. The child must repeat a pattern of movement he already had, and cannot be expected to correct a movement pattern when he has not yet developed intentionality or spatial locations. Some control of abnormal extensor tone, which is often exaggerated in supine, is helpful--a pillow to flex head, and perhaps flexion of legs over a support or one's lap. Stimulus presentation should be clearly lateral--arms forward and midline coordination will come later.

Side-lying may be used if it facilitates movements or visual contact is good. This should be evaluated and not assumed.

As a therapist I used to feel concern about the child's "use of abnormal patterns" and was concerned that an increase of tonic reflex activity might result from these activities in supine. Experience has caused me to revise these premises and to be more concerned about the effects of never acting on environment, both on cognitive and motor development. As the child develops intentionality one sees the child break through abnormal limb patterns, and with the development of reach and grasp one can work toward the more symmetrical midline movements. The reader is referred to the work of Burton White and others describing the very early development of visually guided reach (Bruner, 1969; White, 1969; White, Castle and Held, 1964).

The little boy we have referred to in the tapes began with an abnormal limb extension pattern, arm extending, rotating inward and across body. When we first presented chimes to him they were arranged so he could see them with string attached to his habitual movement. With shaping he was helped to develop an extension-abduction swat to side, actually breaking up his abnormal limb pattern and preparing for synchronizing visual and hand locations in a variety of placements. Another child shown with string-rig began with arms flexed at elbows, retracted at shoulders, and the only movement she made was a hit backwards on surface. When she was aware she was producing a spectacle, we gradually shaped so that the forward component of this movement was the activator, and then progressed to a forward extended swat. Another child shown had very strongly extended, internally rotated and abducted arms in front when in sitting and could not move his arms in this position. In supine, however, he swatted, progressing from using his abnormal extension pattern toward the middle to an abducted

swat, and gradually opening hands. He developed reach and grasp in supine, and we are working on midline coordination and breaking up abnormal patterns in sitting where hand use is still very limited. There can be no recipes in positioning. Our corrective positioning may be preventing the child from doing and acting on environment.

The child should not be left too long in an asymmetric supine posture, or any posture, as that can contribute to deformities. We should be concerned with providing a variety of postures, with different advantages or disadvantages understood for each. "Good positioning" may also be deformity producing if the child's postures are limited, and crippling for early sensory organization and cognitive development if the child cannot organize attention, sensory functions or act effectively.

Communication for the Profoundly Handicapped Child

The child in the video-tape is at the level of signal communication. Things and events have begun to be "signifiers" for him--when placed in supine on pillow in usual sequence of events, and seeing me at his side, he anticipated a swatting activity and laughed and swatted. When he saw the baby food jar he became excited, anticipating eating. When the therapist said "Roll" and gave him a touch cue at his hip, like a little piece of how she used her hand to help him roll, he anticipated and started the roll. In this case a "signifier" "signalled" him to act. When his mother touched his sides and said "Do you want to be picked up?" he was signalled to lift his arms responsively. When he wanted more bouncing on the big ball he signalled for adult to continue by kicking his legs and vocalizing. He signalled for adult to reactivate the music box by swatting.

These signals on his part are examples of a level of the causality subscale where the child learns to use ways he has acted on environment

to repeat enjoyed events caused by an adult. They are called "procedures" and are chosen by the child, not arbitrarily by the adult. Our goal is to see generalization of this type of signalling across many situations so that he thinks of himself as the "Big Signaller." We introduced a new situation during the session taped. During spoon-feeding his mother was shown how to have him grasp her little finger of the hand holding the spoon. He quickly learned to signal for more when asked if he wanted more fruit by pulling her hand toward his mouth. He laughed, thinking he was pretty smart. We might expect to see this type of behavior snowball if we are alert to potential eliciting situations, and to see some increasing specificity to his signals.

As Sharon Anderson emphasizes in her paper on a hierarchial approach to communication, communication starts at birth and develops through stages with increasing representation involved until the child is ready for the learned arbitrary symbol system we call language. We commonly think of pre-requisites to language in terms of mental representation or cognitive base, imitation, and identification with another human being. Two other prerequisites are critical in my opion--the child must already be communicating with people and realize it is a means to achieve wants.

<u>One of the first areas of assessment is level.</u> With the child discussed and other signal level children we look for signal levels: 1) Crying or smiling as a reflection of state; 2) Anticipation of routines based on time factor and physical need; 3) Any looking, touching, tugging, pulling, or fussing at person; 4) Leading person or placing hand, more specific fussing; 5) Anticipatory responses with child acting on basis of situational cues. With higher functioning children we will look for the protosymbolic forms of communication that precede language--referent pointing and call-sounds, and natural gestures which represent actions or things.

A child does not develop signal behaviors till he anticipates, and has beginnings of mental representation for events. In curriculum we will design events that lead to anticipation, deliberately planning signifiers for the child. Often we will also model a higher level of communication. Communication is always in context, and events are planned with function in mind.

The pragmatics of functions of communication. All too often the only communication going on with a child is commands and we are all hung up on issues of compliance. If we will look at the pragmatics of communication, or functions, we will be likely to be more conscious of other ways to communicate to the child, and will be better able to design eliciting situations in which the child communicates to us. We will also have another way to measure and show progress.

The functions most commonly used in classifying communication have been described by Halliday (1973). Those most pertinent to a signal level child are: 1) The Instrumental or "I Want" function. This can be positive, negative, responsive or generated by the child. The signals for more music, more bouncing are of this category. 2) Regulatory or "Do This" function. This function describes a lot of our behavior, but a strong "I want" signal borders on this. 3) Interpersonal "Me and You" function. The child shown uses eye contacts in mutual sharing of pleasurable experiences, greetings, and responsive smiles. 4) Personal "I" function in which child expresses feelings. The child shown uses smiles of pleasure in enjoyed activities, unhappy fussing, and an intellectual "Aren't I Smart" smile when he figures out a new contingency and controls an event. As we see a child beginning to signal we should keep track of the functions in which a signal such as a look or smile is used.

Signals develop increasing complexity (Sugarman as quoted by Snyder, 1976).

At first signals are simple schemes and will be either person directed or object directed. The child smiles at you when you engage in a game and ask if he wants more. He swats the music box for more music. We then see an increasing combining of signal schemes into complex schemes--the child looks at you and touches your hand to signal you, or swats at the music box and vocalizes. These are still oriented toward either person or object. We need to see many complex combinations of signal schemes develop before the child begins to combine the person oriented and object oriented schemes. At first these will be signal to object then to person--child touches object then turns to adult and touches hand and vocalizes. Finally we see child signal first to person then to object. This gradual increase in complexity and combining of orientation might be thought of as a precursor of subject-verb-object constructions.

It is not unusual to find the child's signals are mainly object oriented. Before we label the child as being unable to relate to people we need to look very hard at how we elicit signals. We need to provide opportunities for both person oriented and object oriented and explore what kind of situations elicit which for a child. The person oriented signals may be more likely to occur in auditory-motor body play games where there is a reciprocity between child and adult, or in shared mutual activities. The object oriented signals occur more likely when the adult activates an object spectacle or uses an object in the eliciting situation.

In recording signals used by a child it may be most appropriate to keep a cumulative record, sample specific situations, question mother, etc. rather than emphasize measurement of times child uses a specific signal in a specific situation. I would like to divert the teacher from only concentrating on a few specific target signals to an approach stressing better awareness and eliciting of child's signals in all situations. When one first

sees a child's signal list expand one wonders how much this was due to child change, and how much due to a more perceptive teacher. Charting might simply consist of listing and describing, with dates.

Situation	Child's Signal	Function	Schemes
Pause bounce on ball	Kicks ball	Instrumental, responsive	Single-object directed
Pause music box	Swats box	Instrumental, responsive	Single-object directed
Adult greets child	Smile and vocalization	Interpersonal, responsive	Complex-person directed
Pause patacake game	Touches hands	Instrumental, responsive	Single-person directed
Swats new toy	Smile	Personal-enjoys and intellectual	Single

Modes for Communication and Meaning. In considering what modes can be used best to communicate to child or be used by child, at this level one should not be too arbitrary. At the signal level we use multisensory clusters--with visual, auditory and tactile components--an early form of total communication. We use speech, systematically "putting it in' to all situations. When in doubt about vision we pair touch communication with this.

As one notes things and events which act as signifiers or signals to the child one begins to accumulate information about whether sight of something, or feeling something, a sound, a time, etc. was involved. Often one can't tell which component was most important, and we should be cautious in our assumptions. As children begin to signal to us they normally use signals in different modes-- in the sensory impaired child we may see omissions--never a vocalization, never a look, and this may help us as we look toward future communication possibilities.

Meaning is a special problem for visually impaired and deaf-blind children. No sensory input is meaningful till it is correlated or associated

with something also. If the child is not visually identifying what sounds are about, they must be associated with doing, an action, or something done to him. When sound has no meaning the child may stop attending to whatever he can hear. This is another reason we use a multisensory form of communication with touch and gesture on body, placing child's hands in approximation of sign, etc.

We need to be more thoughtful about our use of sensory stimulation. Many deaf-blind teachers are getting away from this approach and trying to construct inputs that contribute to meaning. For example, rather than rubbing the child with textures or having the child feel textures that have no meaning in terms of his action schemes for objects, and no associations with real life events, we guide the child to feel things in a context. We guide him to feel his socks and shoes in dressing, to look at them, to touch them to feet, to feel them on feet, with the associated verbal input and touch communication--strokes up sides of ankles for sock on, strokes down for socks off, taps on bottom of foot for shoe.

We put the child through whatever is feasible of so-called self-help skills so that he has more perceptual information for the event, even when he is nowhere near ready to begin taking over. A child with visual impairment may perceive cup coming toward mouth as a blur, but it may become a recognizable one and he may smack in anticipation. If we then put it in his hands it may be a banger, roller, or something to drop if he can manipulate it, but it has no relation to the other perceptual event. Only if we guide him to hold it in the act of drinking can he recognize it as something to drink with. Imagery is going to have to be motor and tactual when visual imagery is deficient.

Communication and Attachment

In the beginnings of deaf-blind education establishing an interpersonal relationship with a child was considered the first priority. It still should be, and needs to be taken into account in staff assignments so that there is a significant person for the child.

Communication and attachments are closely related. Some psychologists see the mother and infant's very early communication, their own unique signal system, as being the basis for attachment and even more important than meeting physical needs (Bower, 1977).

The young deaf-blind or multihandicapped youngster raised at home may demonstrate differentiation of people and attachment to parents. When a child does not, this is hard on the parents and leads to an even greater lack of communication. Very early communication begins with the mother reading the baby's signals and needs. The mother develops ways to soothe and manipulate the child's state. Here is where the teacher may need to start. How do you know when the child is hungry, sleepy, or has a dirty pants?

The child begins to show preferential responses and recognition of voice, face, or handling. The mother or teacher may need special handling cues to assist identification. The child begins to differentiate strangers and eventually shows anxiety and avoidance, or protest when mother or caretaker leaves. These stages should be seen as evidence of increasing attachment and ability to think about the person, and handled in that context rather than seen as a misbehavior.

Repeatedly I have seen children who did not differentiate, or prefer their mother, nor smile at her, begin to do these things when we worked on establishing a signal system. Communication is always a private code at first and that is all right. Hopefully these aspects will be perceived as social development and worthy goals in educational programs. The teacher will

come to know the child as a unique person, which indeed he is.

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